

A map of Michigan showing county boundaries and names. The counties labeled include MIDLAND, BRATTON, MONTCALM, SAGINAW, TUSCOLA, SANILAC, ST. CLAIR, SHAWANEE, EDGEMONT, OAKLAND, MACOMB, IVHAM, LIVINGSTON, HILLSDALE, LEWIS, and MONROE. The map is oriented with the coastline of Lake Huron and Lake Erie to the east.

Real Time Monitoring Program

Protecting the Drinking Water Source in the
Huron to Erie Corridor

Reason for Monitoring

- Over 700 spills have been documented along the St. Clair River System since 1986.
- Two of the most notable spills:
 - 8-14-2003 spill of 134 kg of vinyl chloride.
 - 2-1-2004 (Super Bowl Spill) of 42,000 gallons of methyl ethyl ketone.
- A estimated 4.2 million people on the U.S. side receive there drinking water from the Huron to Erie waterway.

Existing Notification Process

Spill and Emergency Reporting Agencies

- State Police
- Spills Action Centre (Toronto)
- Pollution Emergency Alerting System (MDEQ PEAS system)
- MDEQ SE Michigan District Staff
- Drinking Water Treatment Plant Staff

Multiple Tasks

- Provide instant notification of contamination at a WTP intake
- Protect against CBRNE threat
- Provide ambient water quality information at each intake for treatment purposes
- Provide data to improve modeling of the HEC waterway
- Improve decision making during spill events

Primary Goals and Objectives

Establish a monitoring network along the St. Clair River, Lake St. Clair and Detroit River to protect the drinking water supply

- Install monitoring equipment at WTP intakes
- Analyze water quality every 15 - 30 minutes
- Share data (real-time) from the entire network with each WTP
- Institute a water quality alarm notification system

Existing Monitoring Systems

- ORSANCO – Ohio River Valley Water Sanitation Commission
 - The oldest and most well established system
- AMWEDS - Allegheny and Monongahela River early warning system
 - Temporarily out of service due to lack of funding
- Lower Mississippi River early warning system
- Delaware Valley early warning system
- Upper Mississippi River early warning system
- Susquehanna River early warning system

Huron to Erie Corridor WTP Intakes



Funding Sources

- EPA grant with match
 - St. Clair River and Upper Lake St. Clair communities
 - Macomb (and St. Clair) County Health Dept. grant fiduciary
 - Some State funding

- Department of Homeland Security grant
 - Urban Area Security Initiative (UASI)
 - Wayne County communities
 - Administered by Michigan State Police through the MDEQ

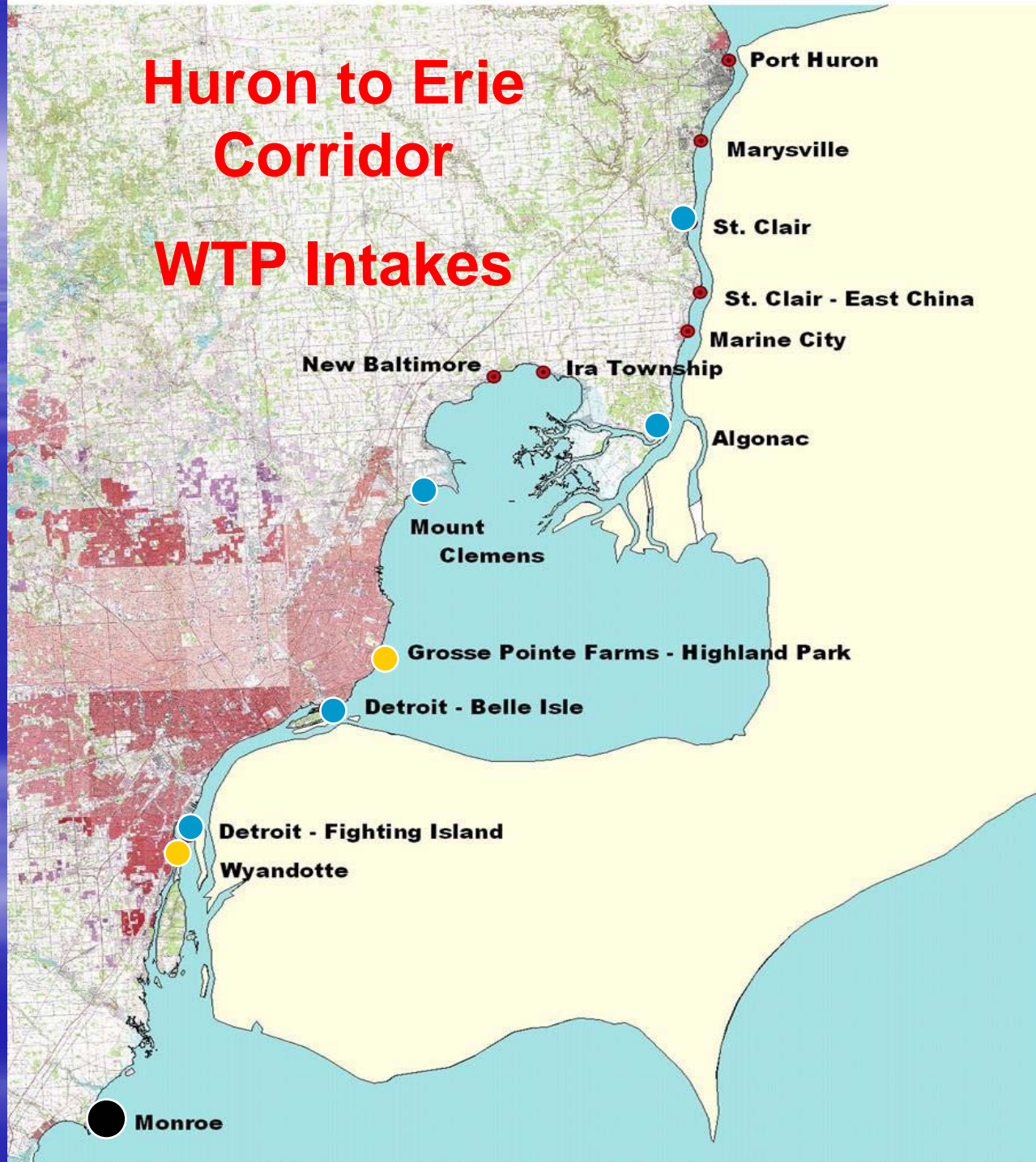
- State MDEQ Grant (s?)
 - Water Bureau Settlement Funds
 - Annual grants

Develop Early Warning Water Quality Monitoring Network

- Conduct suitability and susceptibility analysis to determine threats and resources
- Identify on-line monitoring equipment
 - GC/MS
 - Fluorometer
 - Total Organic Carbon Analyzer
 - Multiparameter probe
- Rapid Toxicity System - Distribution
 - Microtox

Huron to Erie Corridor

WTP Intakes



YSI Multiparameter Sonde

- pH
- Temperature
- Conductivity
- Dissolved Oxygen
- Oxidation/Reduction Potential
- Turbidity
- Chlorophyll



Fluorometer



T U R N E R D E S I G N S 1 0 - 4 1 0 0

HIGH SENSITIVITY AND SELECTIVITY

The TDA-XXX does not have a glass flow cell. Aromatic hydrocarbons are detected in a stream of water which falls through an open chamber; the stream does not contact, dirty or foul the optical windows used for monitoring aromatic hydrocarbons. A proprietary Air Carbon system keeps optical windows bug free in humid environments or hot water applications.

There are no tables, graphs or values to explain. The system's core modeling part has a life expectancy of greater than 5 years. Reactive maintenance involves changing a long-term joint seal and an air filter periodically.

The TD-4000 monitors a flowing water stream continuously. No chemicals, no pre-treatment and no manual manipulation of the sample are required to monitor ammonia levels in water.

The TD-400 directly measures aromatic hydrocarbons in water with accuracies that consistently correlate to regulated laboratory methods.



RTX, gasoline, diesel, jet fuel, crude oil, aromatic solvents and refined petroleum products containing aromatics are detected by the TD-4300 from low $\mu\text{g/l}$ (pp/L) to high ppm (mg/L). For example, the TD-4300 can detect 1 $\mu\text{g/l}$ of gasoline or diesel fuel in water free of interfering organics.

The TD-100 continuously measures the fluorescence of aromatic hydrocarbon compounds in water. Fluorescence occurs when a molecule absorbs light energy of a specific wavelength and emits light energy of a longer wavelength. Fluorescent compounds each have a unique signature, so these compounds can be displayed on an actual concentration.

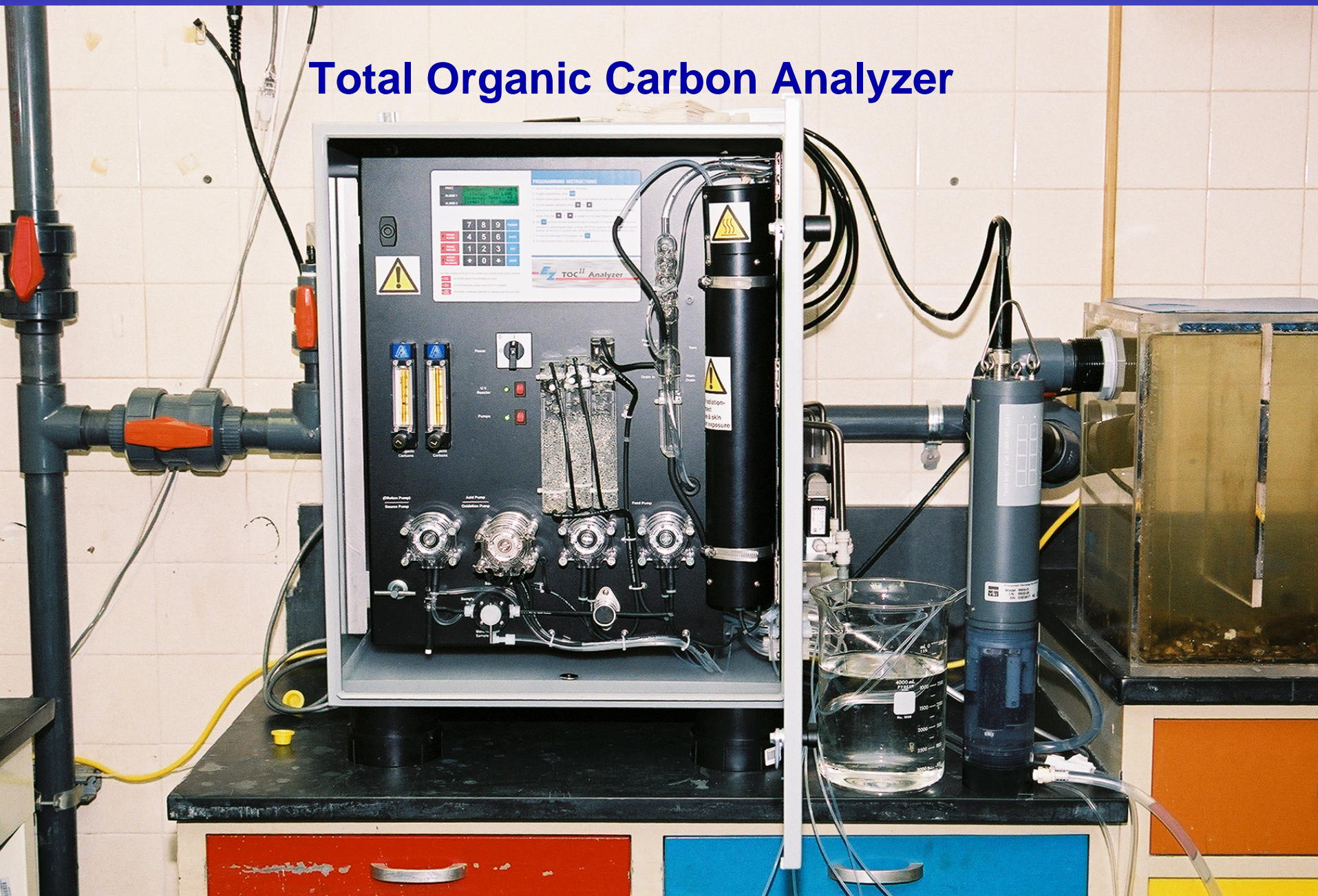
Thermometric technology makes the DO-ORP resistant to interferences by turbid or dirty water which impact on line UV or IR absorption instruments. Most substances absorb light, but very few fluoresce; if a substance does not fluoresce at the specific wavelength for the associated aromatic hydrocarbon, it will not interfere.

The TD-6280 is designed for easy operation. Single on-board software controls drives, 4.2A mA output, diagnostics and calibration.

Total Organic Carbon Analyzer



Total Organic Carbon Analyzer



*Inficon Gas
Chromatograph/
Mass
Spectrometer*



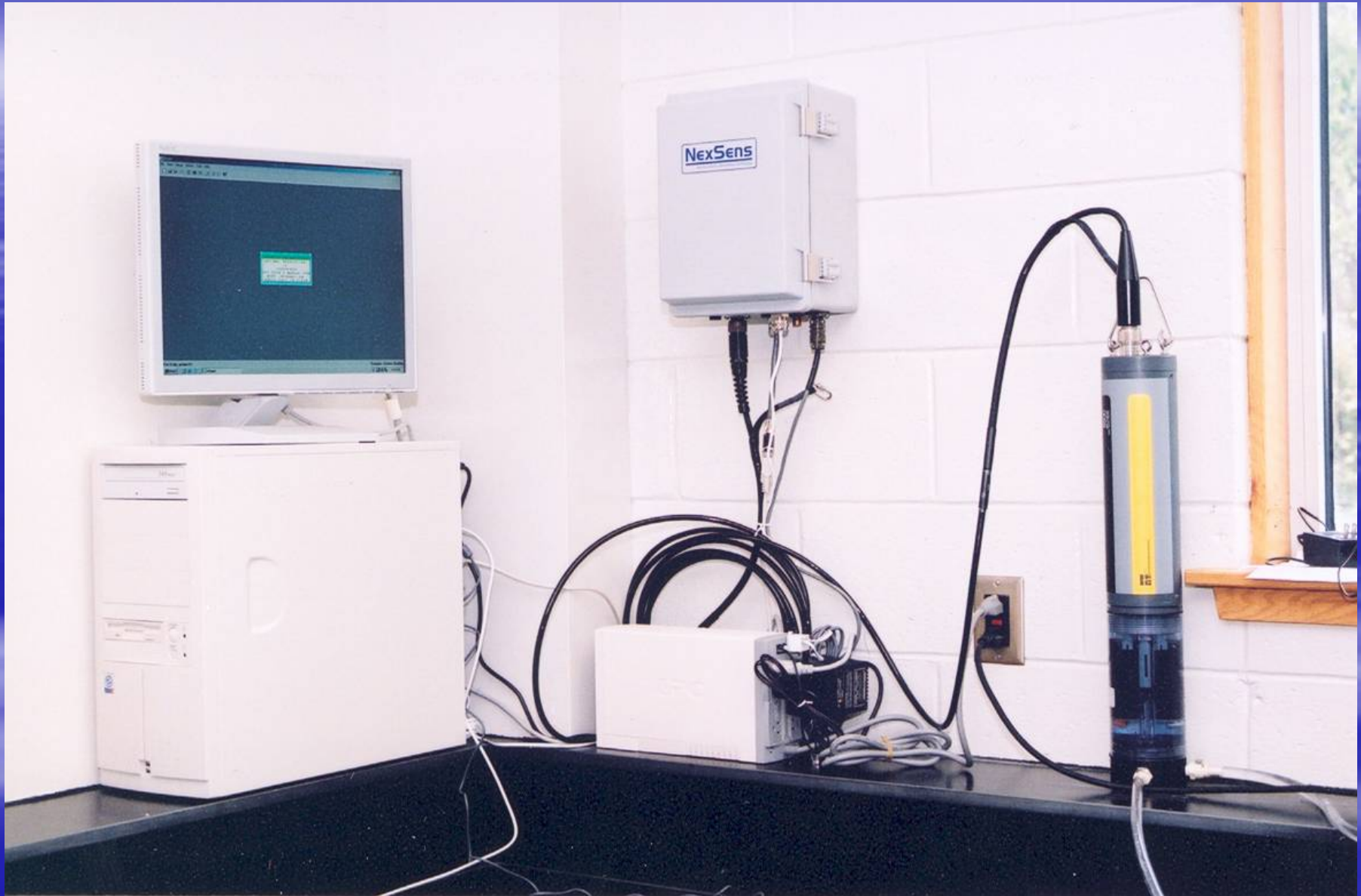
GC/MS

| Compound | Target Concentration (mg/L) |
|-----------------------|-----------------------------|
| *Benzene | 0.005 |
| *m, o, p -Xylene | 3.33 |
| Chloroform | 0.08 |
| Carbon tetrachloride | 0.005 |
| Tetrachloroethene | 0.005 |
| 1,1,1-Trichloroethane | 0.2 |
| 1,1,2-Trichloroethane | 0.005 |
| Styrene | 0.1 |
| 1,2-Dichloropropane | 0.005 |
| Methylene chloride | 0.005 |
| Chlorobenzene | 0.1 |
| Ethylene dibromide | 0.00005 |
| *Toluene | 1 |

GC/MS

| Compound | Target Concentration (mg/L) |
|---------------------------------|-----------------------------|
| 1,2-Dibromo-3-chloropropane | 0.0002 |
| MTBE | 0.04 |
| Hexane | 3 |
| Cyclohexane | 3 |
| Trichloroethene | 0.005 |
| Acrylonitrile | 0.0026 |
| 1,1-Dichloroethene | 0.007 |
| *1,2-Dichloroethane | 0.005 |
| *Vinyl chloride | 0.002 |
| Ethyl benzene | 0.7 |
| 1,2 & 1,4-Dichlorobenzene | 0.6 & 0.075 |
| cis & trans -1,2-Dichloroethene | 0.07 & 0.1 |

Data Logger with YSI probe



Data Management and Dissemination

- Data storage on an off-site project server
- Data shared between the WTPs through a password protected website
- Data visualization using NexSens iChart software



The image shows a screenshot of a web login interface for WQData.com. At the top, there is a header with a lighthouse icon and the text "WQData.com" and "A Web Interface for Real-Time Environmental Data". Below this is a blue bar with the word "LOGIN:". Underneath, there are two input fields labeled "USERNAME:" and "PASSWORD:". Below the password field is a "Go»" button. At the bottom, there is a footer that says "ENTER YOUR USERNAME AND PASSWORD TO VIEW YOUR WEB DATA CENTER".



Data transfer to a public website



St. Clair River - Lake St. Clair Drinking Water Protection Project

Managed by
Environmental Consulting
& Technology, Inc.

MAP

DATA

GRAPH

STATS

PANEL

INFO

FORUM

☒ Port Huron

- ☐ Temp
- ☐ Sp Cond
- ☐ pH
- ☐ ORP
- ☐ Turb+
- ☐ Chlorophyll
- ☐ ODOsat
- ☐ ODO

☒ Marysville

- ☐ Temp
- ☐ Sp Cond
- ☐ pH
- ☐ ORP
- ☐ Turb+

SELECT ALL

GO

DAY

WEEK

MONTH

YEAR

FROM/TO

03/25/2006

03/26/2007



ADMIN LOGIN

Parameter

Samples

Average

Max

Min

St Dev

East China

| | | | | | |
|--------------------|------|-------|-------|-------|------|
| Temp (C) | 1142 | 3.70 | 4.70 | 2.26 | 0.58 |
| Sp Cond (uS/cm) | 1142 | 251 | 262 | 1 | 10 |
| pH (pH) | 1142 | 8.18 | 8.24 | 7.82 | 0.03 |
| ORP (mV) | 1142 | 256 | 520 | 160 | 71 |
| Turb+ (NTU+) | 1142 | 6.80 | 29.90 | 1.80 | 4.74 |
| Chlorophyll (ug/L) | 1142 | 4.0 | 8.6 | 2.3 | 0.7 |
| ODO (mg/L) | 1142 | 12.51 | 12.92 | 12.13 | 0.22 |

Ira Township

| | | | | | |
|--------------------|------|-------|--------|------|-------|
| Temp (C) | 4689 | 1.92 | 12.89 | 1.16 | 1.21 |
| Sp Cond (uS/cm) | 4689 | 241 | 270 | 221 | 9 |
| pH (pH) | 4689 | 8.29 | 8.45 | 7.77 | 0.05 |
| ORP (mV) | 4689 | 112 | 650 | -12 | 63 |
| Turb+ (NTU+) | 4689 | 20.46 | 930.50 | 5.00 | 52.54 |
| Chlorophyll (ug/L) | 4689 | 4.2 | 29.1 | 2.6 | 0.9 |
| ODO (mg/L) | 4689 | 14.16 | 14.79 | 1.44 | 0.35 |

POWERED BY NEXSENS TECHNOLOGY

Notification System

- Develop the Spill Notification Protocol
 - Email?
 - Internet based server alarm?
 - Text message?
- Determine alarm settings/conditions for each parameter
 - MCL or Health Advisory?
 - Method Detection limit?
 - Established normal QA/QC chart values?
- Determine WTP response and corrective actions
- Conduct spill drills to test the system

Not Real Time but Real Good Microtox

Biosensor based toxicity assessment



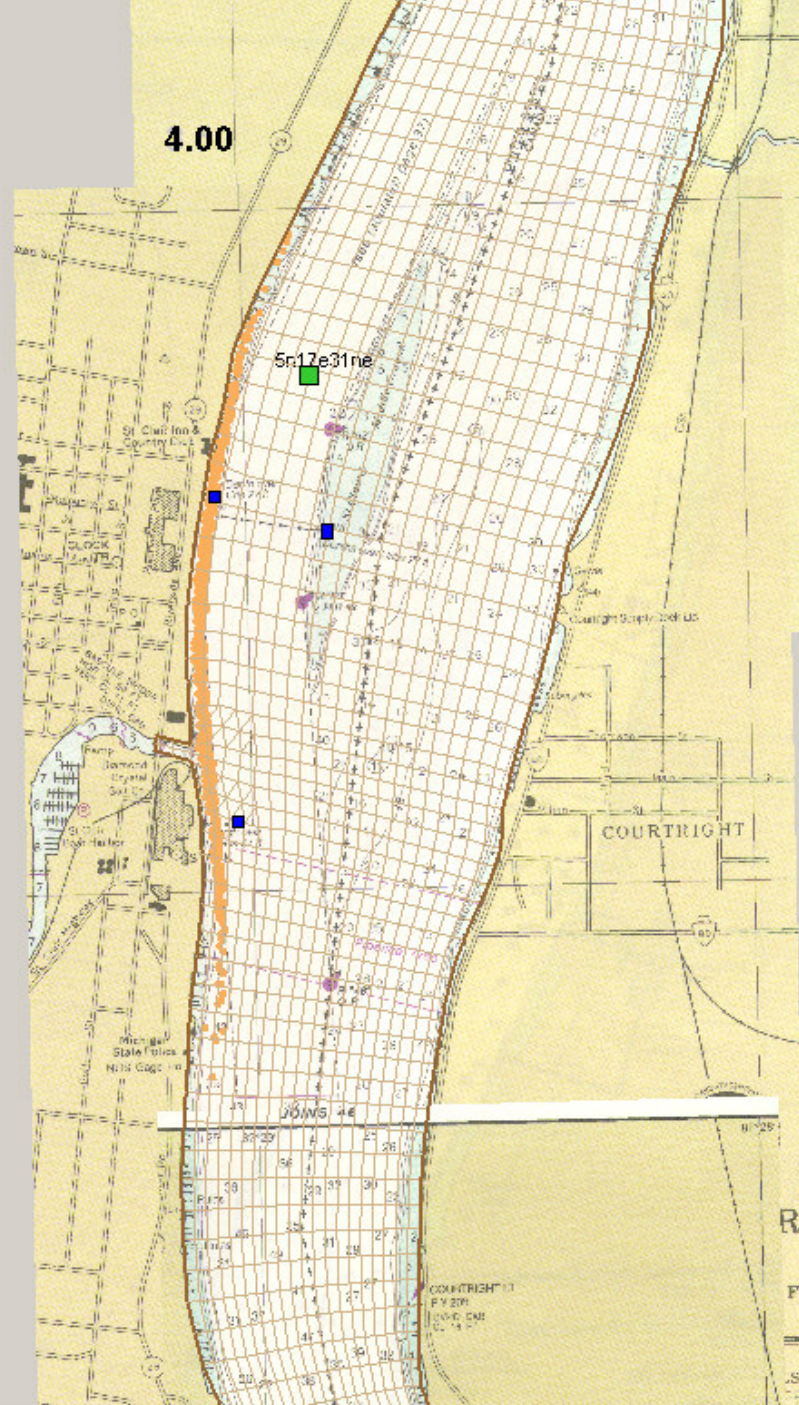
Other Applications

- USGS dimensional models for the St. Clair River and Lake St. Clair
- Controlled Chemical Applications
 - USFWS Lampricide Program
 - MDEQ Aquatic Nuisance Program

Vicinity Map



Particles expected to pass an area near the Village of St. Clair WTP intake about 4 hours after release.





Questions?

Brock F. Howard

howardb1@michigan.gov

517-335-4101

